CLAIMS

What is Claimed is:

1. A reactor for use in electrochemical processing of a microelectronic workpiece, the apparatus comprising.

one or more walls defining a processing space therebetween for containing a processing fluid;

a first fluid flow region in the processing space;

a first electrode disposed in the processing fluid of the first fluid flow region;

a second fluid flow region in the processing space,

a second electrode disposed in the processing fluid of the second fluid flow region, the second electrode comprising at least a portion of the microelectronic workpiece, fluid flow within the first fluid flow region being generally directed toward the first electrode and away from the second electrode, fluid flow within the second fluid flow region being generally directed toward the second electrode and away from the first electrode.

2. A reactor as claimed in claim 1 wherein the first electrode comprises an anode in the electrochemical processing of the microelectronic workpiece.

3. A reactor as claimed in claim 1 wherein the first electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece.

4. A reactor as claimed in claim 1 wherein a single fluid inlet provides processing fluid to both the first and second fluid flow regions

5. A reactor as claimed in claim 1 and further comprising at least one pressure drop member disposed in the processing fluid of the processing space in an intermediate position between the first and second fluid flow regions.

6. A reactor as claimed in claim 1 wherein the first fluid flow region is adjacent the second fluid flow region

7. A reactor as claimed in claim 5 wherein the first fluid flow region is adjacent the second fluid flow region

8. A reactor for electrochemically processing a microelectronic workpiece comprising:

one or more walls defining a processing space therebetween for containing a processing fluid;

a microelectronic workpiece support including one or more conductive members disposed to electrically contact the microelectronic workpiece to provide electrical power for electrochemical processing of the microelectronic workpiece, the microelectronic workpiece support being disposed to bring at least one portion of the microelectronic workpiece into contact with the processing fluid,

at least one electrode disposed in contact with the processing fluid in the processing space, the at least one electrode being spaced from the microelectronic workpiece and positioned to provide electrical power for electrochemical processing of the microelectronic workpiece,

at least one processing fluid inlet disposed to provide a flow of the processing fluid into the processing space,

at least one processing fluid outlet disposed to provide a flow of the processing fluid from the processing space, the at least one processing fluid outlet being positioned within the processing space to direct at least a portion of the flow of the processing fluid about the at least one electrode and away from the microelectronic workpiece as the flow exits from the processing space.

9. A reactor as claimed in claim 8 wherein the at least one electrode comprises an anode in the electrochemical processing of the microelectronic workpiece.

10. A reactor as claimed in claim 8 wherein the at least one electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece.

11. A reactor is claimed in claim 8 and further comprising at least one permeable membrane disposed between the microelectronic workpiece support and the at least one electrode

12. A reactor as claimed in claim 11 wherein the at least one permeable membrane is disposed between a first fluid flow region of the processing space and a second fluid flow region of the processing space

13. A reactor as claimed in claim 12 wherein the at least one processing fluid inlet is disposed in the first fluid flow region.

14. A reactor as claimed in claim 13 wherein the at least one processing fluid outlet is disposed in the second fluid flow region.

15. A reactor as claimed in claim 12 wherein the at least one processing fluid outlet is disposed in the second fluid flow region

16. A reactor as claimed in claim 15 and further comprising a further processing fluid outlet disposed in the second fluid flow region proximate the microelectronic workpiece

17. A reactor as claimed in claim 8 and further comprising a further processing fluid outlet disposed proximate the microelectronic workpiece

18 A reactor as claimed in claim 12 wherein the first and second fluid flow regions are adjacent one another

19. A reactor as claimed in claim 8 and further comprising

a cup disposed in the processing space, the cup assembly including an open end that opens toward the microelectronic workpiece,

a pressure drop member disposed over the open end of the cup, the at least one electrode being disposed in an interior chamber defined by at least the cup and the pressure drop member.

20. A reactor as claimed in claim 19 wherein the pressure drop member comprises a permeable membrane having a conical shape with an apex directed toward the interior chamber

21. A reactor as claimed in claim 19 wherein the at least one processing fluid outlet is disposed to exhaust processing fluid from the interior chamber.

22. A reactor as claimed in claim 8 wherein the one or more walls defining the processing space form a cup having an open upper end

23. A reactor as claimed in claim 22 and further comprising a head assembly including the microelectronic workpiece support, the head assembly being movable with respect to the open upper end of the cup between a workpiece loading position and a workpiece processing position

24. A reactor is claimed in claim 8 wherein the microelectronic workpiece support is rotatable to facilitate rotation of the microelectronic workpiece during electrochemical processing thereof

25. A reactor is claimed in claim 23 wherein the head assembly comprises a rotor motor that is connected to the microelectronic workpiece support to rotate the microelectronic workpiece during electrochemical processing thereof.

26. A reactor for electrochemically processing a microelectronic workpiece comprising:

one or more walls defining a processing space for containing a processing fluid, the one or more walls forming a processing cup having an open top;

a microelectronic workpiece support including one or more conductive members disposed to electrically contact the microelectronic workpiece to provide electrical power for electrochemical processing of the microelectronic workpiece, the microelectronic workpiece support being disposed proximate the open top of the processing cup to bring at least one portion of the microelectronic workpiece into contact with the processing fluid for electrochemical processing,

an electrode housing disposed in the processing cup and having an end that opens toward the microelectronic workpiece support,

a pressure drop member disposed over the open end of the electrode housing,

at least one electrode disposed in an interior region of the electrode housing;

at least one processing fluid inlet disposed exterior to the interior region of the electrode housing to provide a flow of the processing fluid into the processing space;

at least one processing fluid outlet in fluid communication with the interior region of the electrode housing to generate a flow of the processing fluid through the pressure drop member and into the interior region of the electrode housing.

27. A reactor as claimed in claim 26 wherein the at least one electrode comprises an anode in the electrochemical processing of the microelectronic workpiece.

28. A reactor as claimed in claim 26 wherein the at least one electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece.

29. A reactor as claimed in claim 26 wherein the at least one processing fluid outlet draws at least a portion of the flow of the processing fluid about the at least one electrode as the processing fluid exits from the interior region.

30. A reactor as claimed in claim 26 wherein at least a portion of the processing fluid entering the processing space exits from the processing space through the open top of the processing cup

31. A reactor as claimed in claim 26 wherein the pressure drop member comprises a permeable membrane

32. A reactor as claimed in claim 31 wherein the permeable membrane is conical in shape having an apex directed toward the interior region of the electrode housing

33. A reactor as claimed in claim 26 wherein the pressure drop member is conical in shape having an apex directed toward the interior region of the electrode housing

34. An apparatus for use in a reactor assembly used in electrochemical processing of a microelectronic workpiece, the apparatus comprising:

one or more walls defining a processing space therebetween for containing a processing fluid,

a pressure drop member disposed in the processing space to divide the processing space into at least a first fluid flow region and a second fluid flow region, the pressure drop member facilitating generation of a pressure drop thereacross, fluid flow during electrochemical processing of the microelectronic workpiece being from the second region into the first region across the pressure drop member,

a microelectronic workpiece disposed for contact with processing fluid in the second fluid flow region, and

an electrode located in the first region of the processing space

35. A reactor as claimed in claim 34 wherein the at least one electrode comprises an anode in the electrochemical processing of the microelectronic workpiece

36. A reactor as claimed in claim 34 wherein the at least one electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece

37. An apparatus as claimed in claim 34 wherein the pressure drop member comprises a permeable membrane

38. An apparatus as claimed in claim 34 wherein the first and second fluid flow regions are adjacent one another

39. An apparatus for electrochemically processing a microelectronic workpiece comprising

means for containing a processing fluid to form a processing space,

means for providing electrical contact to one or more surfaces of the microelectronic workpiece to supply electrical power for electrochemical processing of the workpiece,

electrode means for supplying electrical power for electrochemical processing of the microelectronic workpiece,

means for providing a first fluid flow region and a second fluid flow region within the processing space, the electrode means being disposed in the first fluid flow region, the means for providing electrical contact being disposed in the

second fluid flow region, processing fluid flow within the first fluid flow region being generally directed toward the electrode means and generally away from the means for providing electrical contact, processing fluid flow within the second fluid flow region being generally directed toward one or more surfaces of a microelectronic workpiece contacted by the means for providing electrical contact and generally away from the electrode means

40. An apparatus as claimed in claim 39 wherein the at least one electrode comprises an anode in the electrochemical processing of the microelectronic workpiece

41 An apparatus as claimed in claim 39 wherein the at least one electrode comprises a cathode in the electrochemical processing of the microelectronic workpiece

42. A method for electrochemically processing a microelectronic workpiece comprising the steps of

dividing a processing space containing processing fluid into at least a first fluid flow region and a second fluid flow region,

locating a first electrode within the processing fluid of the first fluid flow region,

locating a second electrode comprising at least a portion of the microelectronic workpiece within the processing fluid of the second fluid flow region;

generating a fluid flow of the processing fluid within the first fluid flow region that is generally directed toward the first electrode and generally away from the second electrode, and

generating a fluid flow of the processing fluid within the second fluid flow region that is generally directed toward the second electrode and generally away from the first electrode

43. A method as claimed in claim 42 and further comprising the step of providing a negative potential to the first electrode with respect to the second electrode.

44. A method as claimed in claim 42 and further comprising the step of providing a negative potential to the second electrode with respect to the first electrode.

45. A method as claimed in claim 42 wherein the step of generating the fluid flow of the processing fluid within the second fluid flow region comprises the step of supplying processing fluid from a fluid reservoir into the second fluid flow region of the processing space

46. A method as claimed in claim 42 wherein the step of generating the fluid flow of the processing fluid within the first fluid flow region comprises the step of exhausting at least a portion of the processing fluid from the first fluid flow region away from the processing space

47. A method as claimed in claim 42 and further comprising the step of limiting the flow of processing fluid from the second fluid flow region into the first fluid flow region, thereby maintaining a pressure differential between the first fluid flow region and the second fluid flow region

48. A method as claimed in claim 47 wherein the step of limiting the flow comprises the step of providing a permeable membrane between the first fluid flow region and the second fluid flow region

49. An apparatus for use in electrochemical processing of a microelectronic workpiece comprising

a processing space containing processing fluid,

at least one fluid inlet disposed to provide a flow of processing fluid to the processing space,

an electrode assembly disposed in the processing space comprising

an electrode housing having an open end,

a pressure drop member disposed over the open end of the electrode housing, the electrode housing and pressure drop member defining an interior electrode chamber,

an electrode disposed in the interior electrode chamber,

at least one fluid outlet in fluid communication with the interior electrode chamber to thereby draw a flow of processing fluid through the pressure drop member and into the interior electrode chamber.

50. An apparatus as claimed in claim 49 wherein the pressure drop member comprises a permeable membrane.

51. An apparatus as claimed in claim 50 and further comprising a membrane frame disposed over the open end of the electrode housing, the permeable membrane being connected to the membrane frame

52. An apparatus as claimed in claim 49 wherein the pressure drop member has a conical shape with an apex directed toward the interior electrode chamber.